SECTION 716
EMBANKMENT AND SUBGRADE MATERIAL

716.1-GENERAL:

Material for embankment shall be suitable soil, granular material, shale, rock, random material, or borrow material. The material shall have dimension limitations in accordance with the contract documents.

Material for subgrade shall be granular material free of particles larger than 3 inches (75 mm).

716.1.1-Random Material: Random material shall be considered as a mixture of any or all of soil, granular material, or soft shale as described which are permitted by the Engineer to be used in embankment. These are materials that can be incorporated in a 6 inch (150 mm) compacted layer.

716.1.1.1-Soil: Soil material shall be considered as layers or deposits of disintegrated rock, lying on or near the surface of the earth; which has resulted from natural processes, such as weathering, decay or chemical action or a combination of these processes. Material shall be considered as soil when more than 25 percent by weight of the grains or particles pass the No. 200 (75 µm) sieve.

716.1.1.2-Granular Material: Granular material shall be considered as natural or synthetic mineral aggregate, such as broken or crushed rock, gravel, sand, or slag. Shale or fly ash shall not be considered granular material. Granular material shall have not more than 25 percent by weight of grains or particles passing the No. 200 (75 µm) sieve and the plasticity index shall not be more than 6. This material must be capable of being compacted to a stable condition.

716.1.1.3-Soft Shale: Shale shall be considered as a fine grained indurated, detrital material formed by consolidation (normally by compression or cementations or both) of clay, or silt, or clay and silt. Shale as defined may also have some fine sand. Shale is either characterized in the in situ condition as a stratified or massive structure. Shales which break down under three complete coverages with a steel drum roller, meeting the following requirements, shall be classified as soft shale to be placed as specified in 207.7.3.2.1. Smooth drum rollers shall provide a minimum compression of 500 pounds per linear inch (3.45 KN/mm) of roller drum and drum rollers with tamping feet shall provide a minimum compression of 500 pounds per square inch (3.45 KN/mm²) of tamping foot contact. The contractor shall provide the roller or rollers and any other necessary equipment for this test without additional compensation.

716.1.2-Rock: Rock is defined as sandstone, limestone, or concrete that

cannot be incorporated in a 6 inch (150 mm) compacted lift and shall be medium hard or harder.

716.1.3-Hard Shale: Material that meets the description of shale in 716.1.1.3 except that is does not break down under the hardness test shall be considered as hard shale and placed as specified in 207.7.3.2.2 when used as embankment material.

716.1.4-Borrow Material: Borrow shall consist of approved material required for the construction of embankments and other portions of the work and shall be subject to the applicable provisions of 211.

716.2-TEST METHODS

Plastic Limit	AASHTO T 90 or ASTM D 424
Grain Size Analysis	AASHTO T 88 or ASTM D 422
Sieve analysis of fine and coarse aggregate	AASHTO T 27
Amount of material finer than 200 sieve (0.075 mm) in aggregate	AASHTO T 11
Specific Gravity of Soils	AASHTO T 100 or ASTM D854
Specific Gravity and Absorption of Coarse Aggregate	AASHTO T 85 or ASTM C 127
Organic Content	AASHTO T 267
Moisture and density of soil and material having less than 40 percent of particles by weight retained on the ¾ inch (19 mm) sieve	MP 207.07.20
Moisture and density of material having 40 percent or more of the particles by weight retained on the ¾ inch (19 mm) sieve and that are relatively uniform in gradation and can be incorporated in a 12 inch (300 mm) lift or less, and granular subgrade	MP 700.00.24 (See MP 717.04.21, Table 2.2.3.1)
Liquid Limit	AASHTO T 89 or ASTM D 423

716.3-MOISTURE AND DENSITY REQUIREMENTS:

716.3.1-Embankment Moisture: Embankment soil and material having less than 40 percent by weight of particles retained on the ¾ inch (19 mm) sieve shall be moistened or dried to a tolerance of plus three percentage points or minus four percentage points from optimum at the time compactive effort is

applied. However, soils which evidence pronounced elasticity as the result of compactive effort shall be dried to optimum moisture content, if necessary to achieve stability.

716.3.2-Embankment and Subgrade Density:

716.3.2.1- Soil and material having less than 40 percent by weight of particles retained on the ¾ inch (19 mm) sieve shall be compacted within the moisture tolerance to a target percentage of dry density (Note 1) specified in Table 716.3.2.2. The maximum required dry density and the in-place dry density of the soil layers placed and compacted shall be determined by MP 207.07.20.

716.3.2.2- Soil and material having 40 percent or more by weight of particles retained on the ¾ inch (19 mm) sieve that are relatively uniform in gradation and can be incorporated in a 12 inch (300 mm) lift or less, shall be compacted to the target percentage of dry density (Note 1) specified in Table 716.3.2.2. The maximum required dry density shall be determined by Part 1 of MP 700.00.24. The in-place dry density of the soil layers placed and compacted shall be determined in accordance with Part II of MP 700.00.24

TABLE 716.3.2.2

Type of Construction	Target % of Dry Density (Note 1) of Material Having Less Than 40% by Weight Retained on the ¾ in. (19 mm) Sieve	Target % of Dry Density (Note 1) of Material Having 40% or More By Weight Retained on the ¾ in.(19 mm) Sieve and Granular Subgrade
Embankment	95	95
Subgrade	95	95

Note 1--Target percentage of density shall be the percentage of density by which the decision of acceptance is based. The percentage of dry density for each test shall be determined by comparing the in-place dry density with required maximum dry density.

716.3.2.3-Material, as outlined in MP 717.04.21, Table 2.2.3.1, shall be proof rolled with a pneumatic tire roller having an effective weight of 50 tons (45.5 Mg) . Alternate proof rollers, acceptable to the Engineer, may be used in lieu of a 50 ton (45.5 Mg) pneumatic tired roller provided the weight per tire and tire pressure is maintained so that a minimum of 1315 pounds per inch (9.067 KN/mm) width of tire is maintained. The roller shall be operated at a speed of not more than five miles per hour (8 km/hr.). The designated areas to

be proof rolled shall have two or more passes and the entire area shall be systematically covered with the proof rolling. During the proof rolling and after the proof rolling is completed, the area shall be checked for unstable areas or soft spots disclosed by the operation of the proof roller. These unstable areas or soft spots shall be corrected prior to placement of the overlying lifts of material. The Contractor may propose an alternate approach for small areas that are impractical to roll with the proof roller.

716.4-EMBANKMENT ORGANIC CONTENT:

The organic content of the embankment material shall not exceed 7.5 percent by weight as determined by AASHTO T 267.

716.5-ACCEPTANCE OF EMBANKMENT AND SUBGRADE:

The density of the embankment and subgrade will be accepted by the Division on a lot to lot basis provided the lot conforms to the specifications. A lot shall contain five approximately equal sublots. A sublot shall consist of not more than 2,500 cu. yd. (1900 cubic meters) for embankment and 400 linear ft. (120 m) per working width for subgrade. The Contractor's quality control testing shall include one nuclear moisture and density measurement made at a random location within each of the sublots. Each lot shall be presented to the Engineer for acceptance. When a lot consists of more than one lift, the Contractor's quality control testing shall normally include testing on each lift. Testing for density shall be in accordance with 716.3.2.1, or 716.3.2.2, whichever is applicable. The random locations shall be determined in accordance with MP 712.21.26. The Contractor's quality control testing will be evaluated for each lot and acceptance of the lot may be based either upon the Contractor's quality control testing or by independent testing performed by the Division. The acceptance decision will be made as soon as practicable after the Contractor has informed the Engineer that the lot is ready for acceptance.

If the results of density tests on a lot indicate that at least 80 percent of the material, in accordance with 106.3.1 (West Virginia APA), has been compacted to the specified target percentage of dry density, the lot will be accepted. If less than 80 percent of the material has been compacted to the specified target percentage of dry density, no additional material shall be placed on the lot until it has been reworked to meet the specified requirements.

Lots failing to meet the quality requirements shall be reworked by the Contractor at their expense and be resubmitted for acceptance. Evaluation of the reworked lots, when the testing is performed by the Division, shall be at the expense of the Contractor at the unit cost specified in 109.2.2. The quality requirements of this Subsection shall apply to the reworked lots.